

Listing of Claims

The status of the claims in the present application, presented in numerical order:

1. (Canceled)
2. (Currently Amended) A centrifugal separation rotor for centrifugal separation apparatus for separating solid contaminants from a liquid, the rotor comprising:
 - a walled contaminant separation and containment vessel having a longitudinally extending rotation axis, an impervious outer side wall extending about and along the rotation axis spaced radially therefrom and at least one end wall extending from the side wall towards the rotation axis,
 - an outlet passage, leading externally of the vessel, disposed radially inwardly with respect to the outer side wall,
 - said walls defining radially inwardly from the outer side wall an annular contaminant separation and containment zone and the outlet passage defining the radial boundary of the zone,
 - an inlet, arranged to receive liquid to be cleaned and convey it to the contaminant separation and containment zone at a rate less than liquid can be passed by the outlet passage,
 - a mounting arrangement for mounting the rotor for rotation of the vessel about the longitudinal rotation axis, and
 - a fluid motor impeller disposed to receive a jet of drive fluid there against and responsive to drive fluid impingement to rotate the rotor about said longitudinal rotation axis,
 - said inlet further comprising
 - a liquid inlet region, defined about and along the rotation axis by a divider wall disposed radially between the outlet passage and the rotation axis, having a liquid inlet end,
 - a transfer passage, spaced from the inlet end, permitting liquid flow between the inlet region and contaminant separation and containment zone, and

a collection face of said divider wall facing inwardly towards the rotation axis,

wherein the inlet includes a collection impeller comprising

at least one collection impeller vane, each vane upstanding with respect to the divider wall collection face into the inlet region and extending about the rotation axis and along the divider wall from said inlet end towards said transfer passage along a helical path, to constrain the liquid to be cleaned injected into the inlet region to follow a helical path in the direction of rotation of the rotor inlet towards the transfer passage, and

the fluid motor impeller comprises a plurality of motor impeller vanes disposed at or adjacent the inlet end of the inlet, each upstanding with respect to said dividing wall collection face,

wherein substantially closed collection liquid ducts are defined circumferentially a tubular sleeve extending along said rotation axis, said adjacent collection impeller vanes, and said divider wall collection face.

3. (Currently Amended) A centrifugal separation rotor as claimed in claim [[2]] 17 in which the fluid motor impeller includes a plurality of motor impeller vanes disposed at or adjacent the inlet end of the inlet, each motor impeller vane upstanding with respect to said dividing wall collection face, the motor impeller vanes extend extending about the rotation axis and along the divider wall from said inlet end towards said transfer passage in the same directional sense as the collection impeller vanes.

4. (Previously Presented) A centrifugal separation rotor as claimed in claim 3 in which the motor impeller vanes each have a primary face facing in a direction towards the transfer passage and are arranged to receive drive fluid injected into the inlet region on said primary face and deflect spent fluid in a direction between said collection impeller vanes towards the transfer passage.

5. (Previously Presented) A centrifugal separation rotor as claimed in claim 4 in which the helix pitch angle of each collection impeller vane is in the range 35 to 55 degrees.

6. (Previously Presented) A centrifugal separation rotor as claimed in claim 5 in which the helix pitch angle of each collection impeller vane is substantially equal to 45 degrees.

7. (Previously Presented) A centrifugal separation rotor as claimed in claim 6 in which the rotor comprises an assembly of three integral moldings of plastics material, a first moldings comprising one end wall, the inner side wall and at least one collection impeller vane, a second moldings comprising an end wall and divider wall dimensioned to receive at least some of the impeller vanes in contact with the collection face thereof, at least one of said first and second moldings including at least part of the outer side wall, and a third moldings comprising a mounting hub dimensioned to receive the inner side wall therearound.

8. (Previously Presented) A centrifugal separation rotor for centrifugal separation apparatus for separating solid contaminants from liquid, the rotor comprising:

a walled contaminant separation and containment vessel having a longitudinally extending rotation axis, an impervious outer side wall extending about and along the rotation axis spaced radially therefrom and at least one end wall extending from the side wall towards the rotation axis,

an outlet passage, leading externally of the vessel, disposed radially inwardly with respect to the outer side wall,

said walls defining radially inwardly from the outer side wall an annular contaminant separation and containment zone and the outlet passage defining the radial boundary of the zone,

an inlet, arranged to receive liquid to be cleaned and convey it to the contaminant separation and containment zone at a rate less than liquid can be passed by the outlet passage,

a mounting arrangement for mounting the rotor for rotation of the vessel about the longitudinal rotation axis, and

a fluid motor impeller disposed to receive a jet of drive fluid thereagainst and

responsive to drive fluid impingement to rotate the rotor about said longitudinal rotation axis,

 said inlet further comprising

 a liquid inlet region, defined about and along the rotation axis by a divider wall disposed radially between the outlet passage and the rotation axis, having a liquid inlet end,

 a transfer passage, spaced from the inlet end, permitting liquid flow between the inlet region and contaminant separation and containment zone, and

 a collection face of said divider wall facing inwardly towards the rotation axis,

 wherein the inlet includes a collection impeller comprising

 at least one collection impeller vane, each vane upstanding with respect to the divider wall collection face into the inlet region and extending about the rotation axis and along the divider wall from said inlet end towards said transfer passage along a helical path, to constrain the liquid to be cleaned injected into the inlet region to follow a helical path in the direction of rotation of the rotor inlet towards the transfer passage,

 wherein the fluid motor impeller comprises a plurality of motor impeller vanes disposed at or adjacent the inlet end of the inlet, each upstanding with respect to said dividing wall collection face,

 wherein the motor impeller vanes extend about the rotation axis and along the divider wall from said inlet end towards said transfer passage in the same directional sense as the collection impeller vanes,

 wherein the motor impeller vanes each have a primary face facing in a direction towards the transfer passage and are arranged to receive drive fluid injected into the inlet region on said primary face and deflect spent fluid in a direction between said collection impeller vanes towards the transfer passage,

 wherein the helix pitch angle of each collection impeller vane is substantially equal to 45 degrees, and

 wherein the impeller comprises an assembly of three integral moldings of plastics material, a first moldings comprising one end wall, the inner side wall and at least one collection impeller vane, a second moldings comprising an end wall and divider wall

dimensioned to receive at least some of the impeller vanes in contact with the collection face thereof, at least one of said first and second moldings including at least part of the outer side wall, and a third moldings comprising a mounting hub dimensioned to receive the inner side wall therearound,

the centrifugal separation rotor further comprising at least one end wall thereof, extending from the outer peripheral wall towards the rotation axis, including an outlet passage and, between the outer peripheral wall and the outlet passage of at least one end wall, and

a discharged liquid guide extending longitudinally with respect to a said end wall operable to inhibit contact between liquid discharged from the rotor vessel by way of the outlet passage and the external surface of the rotor vessel radially outwardly of the discharged liquid guide.

9-13. (Canceled)

14. (Previously Presented) A centrifugal separation rotor as claimed in claim 2 in which the helix pitch angle of each collection impeller vane is in the range 35 to 55 degrees.

15. (Previously Presented) A centrifugal separation rotor as claimed in claim 2 in which the helix pitch angle of each collection impeller vane is substantially equal to 45 degrees.

16. (Previously Presented) A centrifugal separation rotor as claimed in claim 2 in which the rotor comprises an assembly of three integral moldings of plastics material, a first moldings comprising one end wall, the inner side wall and at least one collection impeller vane, a second moldings comprising an end wall and divider wall dimensioned to receive at least some of the impeller vanes in contact with the collection face thereof, at least one of said first and second moldings including at least part of the outer side wall, and a third moldings comprising a mounting hub dimensioned to receive the inner side wall therearound.

17. (Previously Presented) A centrifugal separation rotor for centrifugal separation apparatus for separating solid contaminants from liquid, the rotor comprising:

a walled contaminant separation and containment vessel having a longitudinally extending rotation axis, an impervious outer side wall extending about and along the rotation axis spaced radially therefrom and at least one end wall extending from the side wall towards the rotation axis,

an outlet passage, leading externally of the vessel, disposed radially inwardly with respect to the outer side wall,

said walls defining radially inwardly from the outer side wall an annular contaminant separation and containment zone and the outlet passage defining the radial boundary of the zone,

an inlet, arranged to receive liquid to be cleaned and convey it to the contaminant separation and containment zone at a rate less than liquid can be passed by the outlet passage,

a mounting arrangement for mounting the rotor for rotation of the vessel about the longitudinal rotation axis, and

a fluid motor impeller disposed to receive a jet of drive fluid there against and responsive to drive fluid impingement to rotate the rotor about said longitudinal rotation axis,

said inlet further comprising

a liquid inlet region, defined about and along the rotation axis by a divider wall disposed radially between the outlet passage and the rotation axis, having a liquid inlet end,

a transfer passage, spaced from the inlet end, permitting liquid flow between the inlet region and contaminant separation and containment zone, and

a collection face of said divider wall facing inwardly towards the rotation axis,

wherein the inlet includes a collection impeller comprising

at least one collection impeller vane, each vane upstanding with respect to the divider wall collection face into the inlet region and extending about the rotation axis and along the divider wall from said inlet end towards said transfer passage along a

helical path, to constrain the liquid to be cleaned injected into the inlet region to follow a helical path in the direction of rotation of the rotor inlet towards the transfer passage,

the centrifugal separation rotor further comprising at least one end wall thereof, extending from the outer peripheral wall towards the rotation axis, including an outlet passage and, between the outer peripheral wall and the outlet passage of at least one end wall,

a discharged liquid guide extending longitudinally with respect to a said end wall operable to inhibit contact between liquid discharged from the rotor vessel by way of the outlet passage and the external surface of the rotor vessel radially outwardly of the discharged liquid guide.

18. (Previously Presented) A centrifugal separation rotor as claimed in claim 8 in which the discharged liquid guide extends around the outlet passage as a circumferentially complete skirt.

19. (Currently Amended) A centrifugal separator comprising a housing including a mounting arrangement to support a rotor including a liquid separation and containment vessel for rotation about a rotation axis, a drainage to direct liquid exiting the vessel away from the rotor, a fluid motor turbine including a drive fluid nozzle operable to direct a stream of drive fluid to motor impeller vanes, and a vessel supply operable to direct liquid to be cleaned to the rotor vessel, wherein the rotor comprises a centrifugal separation rotor for centrifugal separation apparatus for separating solid contaminants from a liquid, the rotor comprising:

a walled contaminant separation and containment vessel having a longitudinally extending rotation axis, an impervious outer side wall extending about and along the rotation axis spaced radially therefrom and at least one end wall extending from the side wall towards the rotation axis,

an outlet passage, leading externally of the vessel, disposed radially inwardly with respect to the outer side wall,

said walls defining radially inwardly from the outer side wall an annular contaminant separation and containment zone and the outlet passage defining the

radial boundary of the zone,

an inlet, arranged to receive liquid to be cleaned and convey it to the contaminant separation and containment zone at a rate less than liquid can be passed by the outlet passage,

a mounting arrangement for mounting the rotor for rotation of the vessel about the longitudinal rotation axis, and

a fluid motor impeller disposed to receive a jet of drive fluid thereagainst and responsive to drive fluid impingement to rotate the rotor about said longitudinal rotation axis,

said inlet further comprising

a liquid inlet region, defined about and along the rotation axis by a divider wall disposed radially between the outlet passage and the rotation axis, having a liquid inlet end,

a transfer passage, spaced from the inlet end, permitting liquid flow between the inlet region and contaminant separation and containment zone, and

a collection face of said divider wall facing inwardly towards the rotation axis,

wherein the inlet includes a collection impeller comprising

at least one collection impeller vane, each vane upstanding with respect to the divider wall collection face into the inlet region and extending about the rotation axis and along the divider wall from said inlet end towards said transfer passage along a helical path, to constrain the liquid to be cleaned injected into the inlet region to follow a helical path in the direction of rotation of the rotor inlet towards the transfer passage, and

wherein the vessel supply comprises a liquid nozzle operable to direct a free jet of said liquid to the inlet end of the inlet,

wherein said impeller vanes are secured circumferentially to a tubular sleeve aligned with said rotation axis,

wherein said impeller vanes taper to decreased width and distance from said tubular sleeve as a function of distance from one of said at least one end walls.

20. (Previously Presented) A centrifugal separator as claimed in claim 19 in which the liquid nozzle is arranged to direct said free jet of liquid to the inlet end of the inlet directly or indirectly incident upon the primary face of each said collection impeller vane such that the collection impeller vanes function also as motor impeller vanes.